D.P.U. 93-7B-A

Application of Nantucket Electric Company:

(1) under the provisions of G.L. c. 164, § 94G and the Company's tariff, M.D.P.U. 193B, for approval by the Department of Public Utilities of a change in the quarterly fuel charge to be billed to the Company's customers pursuant to meter readings in the billing months of August, September, and October 1993; and

(2) for approval by the Department of rates to be paid to Qualifying Facilities for purchases of power pursuant to 220 C.M.R. §§ 8.00 et seq. The rules established in 220 C.M.R. §§ 8.00 et seq. set forth the filings to be made by electric utilities with the Department, and implement the intent of sections 201 and 210 of the Public Utilities Regulatory Policies Act of 1978; and

(3) under the provisions of G.L. c. 164, § 94G for approval by the Department of the actual unit by unit and system performance of the Company with respect to each target set forth in the Company's approved performance program.

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FOR: NANTUCKET ELECTRIC COMPANY
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I. INTRODUCTION

On June 28, 1993, pursuant to G.L. c. 164, § 94G, Nantucket Electric Company ("Nantucket" or "Company") notified the Department of Public Utilities ("Department") of its intent to file a quarterly change to its fuel charge in conformance with its tariff, M.D.P.U. 193B, and to its qualifying facility power purchase rates in conformance with its Power Purchase Rate Schedule, M.D.P.U. 283, and with the Department's rules governing such rates. The Company requested that both these changes be effective for bills rendered pursuant to meter readings in the months of August, September, and October 1993. On July 15, 1993, the Company filed with the Department its proposed changes to the fuel charge and the qualifying facility power purchase rates for the above billing months. In addition, the Company submitted generating unit performance data for the April 1, 1992 through March 31, 1993 performance year.[1]

Pursuant to notice duly issued, the Department held a hearing on the Company's application on July 22, 1993, at the offices of the Department in Boston. Jane Walton, a residential customer of the Company, was granted status as a limited participant. No other petitions to intervene were filed. During the hearing, the Department

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[1] In accordance with G.L. c. 164, § 94G, Nantucket is required to file annually with the Department the actual performance results of generating units in its resource portfolio. Typically, the Company provides these data concurrently with its July fuel charge filing.

determined that additional time was required to investigate performance issues and, accordingly, extended the proceedings in order to investigate variances from the performance goals that had been established for the Company's units in Nantucket Electric Company, D.P.U. 92-40 (1992).[2]

On October 14, 1993, the Department held a hearing addressing generating unit performance matters.[3] The Company presented one witness, John G. Topham, vice president of operations. The evidentiary record in this proceeding includes 16 exhibits and five responses to record requests.

II. PERFORMANCE REVIEW

A. Standard of Review

The Department is authorized to set a quarterly fuel charge for a company's recovery of prudently incurred costs for fuel and purchased power. G.L. c. 164, § 94G(b). To aid in determining the prudence of such costs the Department is required to annually set performance

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[2] On August 2, 1993, the Department issued an Order in Nantucket Electric Company, D.P.U. 93-7B establishing the Company's fuel charge and its qualifying facility power purchase rates for the billing months of August, September, and October 1993.

[3] Ms. Walton did not participate in the performance review portion of the proceedings.

goals for the generating units that provide electric power to jurisdictional electric companies. G.L. c. 164, § 94G(a). In goal-setting proceedings, a company proposes targets, subject to Department review, for both individual generating units and that company's overall system. The Department reviews the proposed goals and issues an Order establishing both unit and system-wide performance goals for the subsequent twelve-month period.

In particular, G.L. c. 164, § 94G(a) states in part that each company

> shall describe for the time period or periods designated reasonably attainable targets which shall include a thermal efficiency target for the performance of the company .... Such program also shall provide for the efficient and cost-effective operation of individual generating units by an electric utility company in meeting the minimum needs of each unit of said company to maintain sufficient reserves of power for purposes of reliability and efficiency. Such program also shall describe the historic data, industry standards or reports, simulation models or other information and techniques upon which projections of the company's performance are based and shall include, as goals for individual and system plant performance, availability, equivalent availability, capacity factor, forced outage rate, heat rate on a unit by unit basis and such other factors or operating characteristics required by the Department. Any such program may specify a value or a range of values for the operating characteristic in question and shall reflect operating conditions when overall performance is optimized.

The availability factor ("AF") of a unit is the fraction of time during which the unit is capable of generating power at any level. AF, which is expressed as a percentage, measures how often a unit was available to generate power, but is not a measure of the amount of power generated. AF takes into account the effect of planned outage-hours ("POH") and

unplanned outage-hours ("UOH") on a unit's availability. POH are outage-hours that are scheduled well in advance of the date on which they occur. UOH comprise five categories of outage-hours. The first three categories ("UOH 1, 2 and 3"), also known as forced outage-hours ("FOH"), are outages caused by conditions that require removing a unit from service on, at most, a few days' notice. The fourth category ("UOH 4") represents maintenance outage-hours ("MOH"), which are outages that can be delayed beyond the end of the next weekend, but that take a unit out of service before its next planned outage. In the fifth category ("UOH 5") are outage-hours which extend a planned outage beyond its scheduled duration. The formula for AF is a ratio of period hours ("PH"), less POH and UOH, to PH; that is

$$AF = \frac{PH - POH - UOH}{PH}$$

The equivalent availability factor ("EAF") of a unit is the fraction of maximum generation that a unit would be able to produce if limited only by outages and deratings. Deratings are reductions in a unit's maximum power level. They can result from either (1) unit conditions, such as equipment limitations, or seasonal conditions, such as ambient water temperature or (2) environmental restrictions. EAF, expressed as a percentage, differs from AF in that it takes into account equivalent unit derated hours ("EUNDH") and equivalent seasonal derated hours ("ESDH"). EUNDH comprises equivalent planned derated hours

("EPDH") and equivalent unplanned derated hours ("EUDH"). Equivalent derated hours are calculated by multiplying the duration of each derating, in hours, by the number of megawatts by which the unit is derated, and dividing the product by the maximum capacity of the unit. Gross EAF is calculated by using the gross maximum capacity of a unit to calculate equivalent derated hours, while net EAF is calculated using equivalent derated hours based on maximum net capacity. Gross maximum capacity includes the capacity required to supply electricity to run the unit. Net maximum capacity ("NMC") is the maximum capacity available after station service requirements have been met. The formula for either net or gross EAF can be expressed as

$$EAF = \frac{PH - POH - UOH - EUNDH - ESDH}{PH}$$

Net capacity factor ("CF") is a ratio of the number of megawatthours ("MWH") a unit has generated during a period of time in excess of station service requirements, compared to the maximum it could have generated if it had produced its net maximum capacity during the entire period. CF indicates how much power a unit generated during a given period,

compared to the maximum amount of power it theoretically could have generated during that period. CF is usually expressed as

Net Actual Generation

$$CF = \frac{}{NMC \times PH}$$

Forced outage rate ("FOR") measures the amount of time that a unit was completely out of service because of forced outages during a period, relative to the amount of time that the unit was actually in service during the same period. FOR takes into account the unit's FOH, but not the other types of unplanned outages. It is calculated by dividing FOH by the sum of FOH and service hours ("SH"). A unit's SH are the hours in a given period during which the unit was in service generating electricity. The formula for FOR can be expressed as

$$FOR = \frac{FOH}{FOH + SH}$$

Heat rate ("HR") compares the energy input used by a unit during a given period, expressed in British Thermal Units ("BTU"), to the electrical generation of the unit, in kilowatthours ("KWH"), during the same period. HR is a measure of a unit's thermal efficiency. Net HR is usually expressed as

$$HR = \frac{\text{Fuel Energy Consumed}}{\text{Net Actual Generation}}$$

As noted, in accordance with G.L. c. 164, § 94G, the Department conducts annual goal-setting proceedings with each company over which it has authority to do so. In these proceedings, the performance programs submitted by a company are reviewed and goals are developed for AF, EAF, CF, FOR, and HR based on the formulas

described above. At the conclusion of goal-setting proceedings, the Department issues an Order establishing both unit and system-wide goals for a subsequent twelve-month performance period.

Also in accordance with G.L. c. 164, § 94G, the Department conducts annual performance review proceedings wherein actual performance data obtained during a company's performance period are reviewed and compared to the goals that had been set for that period in a prior goal-setting proceeding. Should a company fail to achieve one or more of the goals established for a performance period under review, the company must present evidence explaining such variance at the next fuel charge proceeding. G.L. c. 164, § 94G(a). The Department conducts an investigation into the circumstances behind each failure. These investigations typically involve a detailed review of activities surrounding particular generating units in order to determine whether a company, in operating and maintaining its units, followed all reasonable or prudent practices consistent with the statute. Specifically, the Department must

> make a finding whether the company failed to make all reasonable or prudent efforts consistent with accepted management practices, safety and reliability of electric service and reasonable regional power exchange requirements to achieve the lowest possible overall costs to the customers of the company for the procurement and use of fuel and purchased power included in the fuel charge. If the department finds that the company has been unreasonable or imprudent in such performance, in light of the facts which were known or should reasonably have been known by the

> company at the time of the actions in question, it shall deduct from the fuel charge proposed for the next quarter or such other period as it deems proper the amount of those fuel costs determined by the department to be directly attributable to the unreasonable or imprudent performance.

G.L. c. 164, § 94G(a).

The Department's standard for determining the prudence of a company's actions appears at G.L. c. 164, § 94G.[4] If a company expects to recover its costs, including purchased power costs incurred as a result of unit outages, the company must "demonstrate the reasonableness of energy expenses sought to be recovered through the fuel charge." G.L. c. 164, § 94G(b). The Department is directed to disallow such costs if (a) the company fails to sustain its burden of proof that its actions were prudent, or (b) despite the company's making a prima facie case, the Department concludes that the company's actions were imprudent and proximately caused the fuel

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[4] "The statutory context ... is provided by the authority granted the Department in G.L. c. 164, § 94G(a), to deduct from a fuel charge proposed for the next quarter the amount of those fuel costs determined to be directly attributable to a company's unreasonable or imprudent performance; and, in § 94G(b), to deduct that amount determined to be directly attributable to a company's defective operation of a unit. Each determination is to be made in light of the facts which the company knew or should reasonably have known at the time of the actions in questions." Boston Edison Co. v. Department of Public Utilities, 393 Mass. 244, 245 (1984).

costs or incremental replacement power costs for which recovery is sought.[5] G.L. c. 164, § 94G.

In applying this standard, the Department has relied on critical path analysis, a method for determining whether a challenged company decision or discrete work item conducted during an outage may be judged to have caused or prolonged the outage.[6] See Fitchburg Gas and

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[5] For the purposes of this proceeding, incremental replacement power costs are the difference between the costs for power to replace a unit which is not available for service across a given period, and the fuel and operating costs that would have been incurred had that unit operated during the period.

[6] Critical path analysis is a commonly-used planning tool in large engineering and construction projects. It may be applied prospectively (an "as-planned" critical path may be developed for use) during a project to direct activities, and retrospectively to assess the conduct of an outage and the prudence of outage management (an "as-built" critical path would reflect the sequences and durations of activities actually experienced). The result of a critical path analysis is a network graphically depicting a schedule of activities and their sequence, durations, logic, interrelationships, and dependencies.

The critical path through a generating unit outage is the chain of activities representing the shortest possible path through the last event of the outage. The sum total of the durations of each activity on the critical path defines an outage's total duration. If an activity on the critical path is delayed, by definition, an equal delay is realized in the completion of the outage. A complex outage may have more than one critical path; and these are known as concurrent or parallel critical paths.

The effect of a delay in an outage activity on the overall schedule can be assessed only against the critical path. An activity not on the critical path may be delayed but still have no effect on the duration of an outage or purchased power costs. But an activity not on the prospective or "as-planned" critical path also may be so

(continued...)

Electric Light Company, D.P.U. 87-5A-1, at 13 (1989); Boston Edison Company, D.P.U. 1009-G (1982).

A performance review addresses the performance of a company's units during the performance year. The performance of certain units in which that company has contractual rights to capacity or output, rather than ownership interests, is, in the first instance, the proper subject of other docket inquiries. In keeping with established precedent, should it be determined in other inquiries that imprudent or unreasonable actions resulted in lost availability of units from which a company also received power, the Department may disallow the recovery of resultant incremental replacement power costs incurred by that company, in order to protect ratepayers from the adverse consequences of any imprudence.

Commonwealth Electric Company v. Department of Public Utilities, 397 Mass. 361, 366 n.2 (1986).

Since 1985, the Department has held that a company must refund to ratepayers incremental replacement power costs that result from imprudence committed by its independent contractors to whom the

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[6](...continued)
delayed as to become itself the actual critical path and be deemed so in retrospect. Delay on the critical path does not necessarily result from imprudence: the cause may be conditions not reasonably foreseeable or preventable, new regulatory requirements, force majeure, etc.

company delegates the responsibility for repair work. Nantucket Electric Company, D.P.U. 92-7B-A at 15 (1993); Boston Edison Company, D.P.U. 92-1A-A at 42, 44 (1993); Boston Edison Company, D.P.U. 88-1A-A at 51 (1988); Boston Edison Company, D.P.U. 85-1B-2, at 15-18 (1985); Western Massachusetts Electric Company, D.P.U. 85-8F-2, at 12-13 (1985). A company may not insulate itself from responsibility for the conduct of its business by engaging contractors. Section 94G of G.L. c. 164 applies with equal force to a company's independent contractors on the principle that providing electric service is part of an electric company's "nondelegable statutory obligations." Commonwealth Electric Company v. Department of Public Utilities, 397 Mass. 361, 366 n.2 (1986).

B. Overview

The Company supplies electricity at retail to the Island of Nantucket, which is not interconnected with the mainland or with any other electric company or system. Thus, the Company is distinguishable from most other New England utilities in that it is completely dependent upon itself and any independent power producers on Nantucket Island for its generation needs. The Department sets goals for units which a company owns and operates, units in which a company has an ownership interest but does not operate, and units from which power is received under life-of-the-unit contracts. In D.P.U. 92-40, the Department set goals for Nantucket's

eleven operating internal combustion (diesel) engines and associated generators, variously sized from 700 kilowatts ("KW") to 6.9 megawatts ("MW"), with a total installed generating capacity of 30 MW. The older units in the Company's system are Units 1 through 7.[7] The bulk of the Company's generation is produced by Units 5, 6, and 7. In January 1987, the Company installed two emergency diesel standby units, designated as Unit 8 and Unit 9. The Company also operates two diesel generators, designated as Unit 10 and Unit 11, which the Company initially leased and subsequently purchased. In addition, in October and November 1988, the Company installed two 3,700 KW gas turbines, designated as Unit 12 and Unit 13, which operate as peaking and reserve units at Nantucket's airport facility.

Because individual HR data for some units was unavailable, HR goals were set in D.P.U. 92-40 for Units 5 through 13 only. In Nantucket Electric Company, D.P.U. 89-35, at 12 (1989), the Department found that Units 1 and 4 were used less frequently, and thus that any fuel savings that might be achieved by carefully monitoring HR would be outweighed by the costs of metering. As was stated in Nantucket Electric Company, D.P.U. 84-57-B at 4 (1984), the Department "does not intend to order the Company to make

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[7] Units 2 and 3 are currently in a deactivated status and did not operate during the performance year (Exh. N-1, at 11). Accordingly, in D.P.U. 92-40, the Department did not establish goals for those two units (id.).

expenditures which will not produce significant benefits for ratepayers." Therefore, in D.P.U. 92-40, the Department did not set HR goals for Units 1 or 4.

This performance review proceeding focused on the actual performance of Units 1, and 4 through 13 during the performance year ending March 31, 1993. As in prior years, the Company's July 1993 fuel charge filing included the actual performance data for the performance year and a brief discussion of performance-related activities. In Table A of Exhibit N-2, the Company provided the actual performance results achieved by Nantucket's generating units and the goals set for those units in D.P.U. 92-40, which have been reproduced in Table 1 attached to this Order.

The information in Table 1 shows that some of the Company's units did not achieve their EAF. Certain units also failed to meet other performance goals established in D.P.U. 92-40. Accordingly, the Department investigated the reported variances between the goals and the actual performance results of the Company's generating units.

C. Performance Issues and Findings

The Company provided detailed explanations of each problem that affected the performance of its generating units during the subject performance year. According to the Company, in January 1993, Unit 1 went out of service and has not been reactivated because of the

considerable age of the unit (45 years), its relatively small size (700 KW), and the substantial expenditures that would be required to return the unit to active status ($170,000) (Exhs. N-1, at 10; DPU-1; Tr. at 12-13). The Department reviewed the testimony and exhibits submitted by the Company and finds no evidence that the failure of Unit 1 resulted from any unreasonable or imprudent action. The Department also finds that the Company's decision not to reactivate Unit 1 was reasonable and prudent.

The record also shows that with the exception of Unit 7, which is the Company's largest and most efficient unit, all of the Company's generating units achieved their CF goals established in D.P.U. 92-40. Therefore, the Department's investigation focused on the causes of the outages experienced by Unit 7 during the performance year. The record shows that Unit 7 missed its goals generally because of the 1992 overhaul extended to address the problems caused by excessive vibration of the unit (Exhs. N-1, at 11; DPU-5). According to the Company, it had failed to identify the root cause of the excessive vibration before the end of the 1992-1993 performance year (Tr. at 89). The record shows that the vibration problems at Unit 7 persisted during the next, 1993-1994 performance year (Exh. DPU-5). According to the Company, the vibration problems experienced by Unit 7 during the 1992-1993 performance year might have resulted from the same causes that adversely affected performance of the unit during the next

performance period; these currently are being investigated by the Company (Tr. at 90-92, 104-106).

Because the Company had not completed its investigation of the root causes of the problems experienced by Unit 7 during 1992-1993 performance year, and because the problems experienced by Unit 7 during the next, 1993-1994 performance year, that will be investigated by the Department in the next Nantucket's performance review proceeding appear to be related to the same root causes, the Department finds it appropriate to delay its review of those issues until the next Nantucket's performance review.

Based on the record, the Department finds no evidence that any outage or derating at the Company's generating units resulted from unreasonable or imprudent actions. However, if in the next performance review the Department finds that the root causes of the problems experiences by Unit 7 were the result of unreasonable actions or imprudence, the Department may disallow the replacement power costs incurred during either 1992-1993 or 1993-1994 performance years.

III. ORDER

Accordingly, after due notice, hearing, and consideration, it is

ORDERED: That Nantucket shall retain all costs recovered through the fuel charge attributed to units from which it received power during the performance year, pending

findings in the Department's review of the Company's generating unit performance during the 1993-1994 performance year; and it is

FURTHER ORDERED: That the Company shall, with its fuel charge filing for the months of August, September, and October 1994, submit performance data for the Company's generating units and for its system as a whole for the performance year ended March 31, 1994, and explain any variances from the goals approved by the Department in Nantucket Electric Company, D.P.U. 93-25 (1993).

By Order of the Department,